CLAIMS

What is claimed is:

Claim 1 - A combustion engine providing clean power for various applications and featuring low NOx production and low CO2 release into the atmosphere, comprising in combination;

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air separator having an inlet coupled to said source of air, a nitrogen separator, an oxygen enriched air outlet, and a nitrogen outlet separate from said oxygen enriched air outlet, such that at least a portion of the nitrogen is removed from the air entering said inlet;

a fuel combustor, said fuel combustor receiving fuel from said source of fuel and oxygen enriched air from said outlet of said air separator through an oxygen enriched air inlet adapted to deliver substantially H2O free oxygen enriched air into said fuel combustor, said combustor combusting the fuel with the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including H2O and CO2, said combustor having a discharge for said combustion products;

a combustion products separator which separates at least a portion of the H2O from other combustion products including CO2 coupled to said discharge and including an H2O outlet and an exhaust for the other combustion products including CO2;

a compressor coupled to said exhaust, said compressor pressurizing fluids passing there through to a pressure above atmospheric pressure; and

a terrestrial formation injection system downstream from said compressor, said injection system coupled to said compressor and to a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein.

Claim 2 - The combustion engine of Claim 1 wherein said combustion products separator includes a condenser, said condenser having a temperature and pressure

therein at which H2O condenses into a liquid phase and at which CO2 remains in a gaseous phase.

Claim 3 - The combustion engine of Claim 2 wherein a cooler is oriented between said exhaust of said combustion products separator and said injection system, said cooler having sufficient capability to cool CO2 exiting said combustion products separator at said exhaust to a temperature below a liquefaction temperature for CO2, such that the CO2 is liquefied.

Claim 4 - The combustion engine of Claim 3 wherein said air separator includes means to cool the air from said source of air to a temperature at which oxygen in the air liquefies for separation of the oxygen from the nitrogen, at least a portion of the nitrogen removed from the air directed to said cooler for cooling of the CO2 exiting said exhaust of said combustion products separator.

Claim 5 - The combustion engine of Claim 3 wherein a CO2 pump is located between said cooler and said terrestrial formation injection system, said CO2 pump increasing a pressure of the CO2 exiting the exhaust of the combustion products separator while the CO2 is in a liquid state.

Claim 6 - The combustion engine of Claim 3 wherein a combustion product expansion device is interposed between said discharge of said fuel combustor and said condenser, said combustion product expansion device including means to output power from said engine, said power at least partially used to supply operative power to said air separator and said compressor;

wherein at least a portion of the H2O exiting said condenser through said H2O outlet is routed through a fluid conduit to said fuel combustor where the H2O is combined with said combustion products to decrease a temperature of the combustion products and increase an amount of H2O exiting said discharge of said fuel combustor;

wherein said combustion product expansion device includes three turbines including a high pressure turbine located downstream from said discharge of said fuel

combustor and upstream from a reheater, said reheater receiving fuel from said source of fuel and oxygen enriched air from said outlet of said air separator, said reheater combusting the fuel with the oxygen enriched air to produce combustion products including H2O and CO2, said reheater also receiving H2O and CO2 from said high pressure turbine and mixing said H2O and said CO2 from said high pressure turbine with said H2O and said CO2 generated within said reheater; and

an intermediate turbine located downstream from said reheater and upstream from a low pressure turbine, a feed water preheater interposed between an intermediate pressure turbine discharge and an inlet to said low pressure turbine, said feed water preheater including means to increase a temperature of the H2O exiting said H2O outlet of said condenser before said H2O is directed back into said fuel combustor.

Claim 7 - The combustion engine of Claim 3 wherein a cooler/condenser is located between said compressor and said cooler, said cooler/condenser including means to condense additional H2O vapor exiting said condenser through said exhaust.

Claim 8 - The combustion engine of Claim 5 wherein said CO2 pump includes means to pressurize the fluids passing there through to a pressure which results in a pressure at said formation of between 10 psia above a pressure of the fluid in said formation and 0.8 psia per foot of depth of said formation.

Claim 9 - The combustion engine of Claim 1 wherein said injection system is configured to deliver the combustion products other than H2O and including CO2 beneath the surface of an ocean.

Claim 10 - The combustion engine of Claim 9 wherein said injection system is configured to deliver the combustion products including CO2 into a porous underground geological formation.

Claim 11 - The combustion engine of Claim 1 wherein said exhaust of said combustion products separator discharges primarily CO2 and said compressor pressurizes the CO2 until the CO2 becomes a super critical fluid.

Claim 12 - The combustion engine of Claim 1 wherein said terrestrial formation injection system is configured to deliver the combustion products including CO2 into an aquifer.

Claim 13 - A combustion engine providing clean power for various applications and featuring low NOx production and low CO2 release into the atmosphere, comprising in combination:

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air separator having an inlet coupled to said source of air, a nitrogen separator, an oxygen enriched air outlet, and a nitrogen outlet separate from said oxygen enriched air outlet, such that at least a portion of the nitrogen is removed from the air entering said inlet;

a fuel combustor, said fuel combustor receiving fuel from said source of fuel and oxygen enriched air from said outlet of said air separator through an oxygen enriched air inlet adapted to deliver substantially H2O free oxygen enriched air into said fuel combustor, said combustor combusting the fuel with the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including H2O and CO2, said combustor having a discharge for said combustion products;

a combustion product expansion device coupled to said discharge of said combustion device, said expansion device outputting power from said system and having an exhaust for said combustion products;

a condenser coupled to said exhaust, said condenser having an H2O outlet for liquid H2O and a gaseous combustion product outlet, said condenser configured such that the CO2 remains gaseous and exits said combustor through said gaseous combustion product outlet;

a compressor coupled to said gaseous combustion product outlet, said compressor compressing said gaseous combustion products to above atmospheric pressure; and

a terrestrial formation injection system coupled to said compressor and to a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein.

Claim 14 - The system of Claim 13 wherein said compressor has sufficient capability to compress gases passing there through to a pressure at which a liquid phase of CO2 can exist.

Claim 15 - The system of Claim 13 wherein a cooler is interposed between said condenser and said terrestrial formation injection system, said cooler having sufficient capability to cool the gaseous combustion products to a temperature at which CO2 transitions into a liquid phase.

Claim 16 - The system of Claim 15 wherein said terrestrial formation injection system includes a liquid CO2 pump, said liquid CO2 pump including means to further pressurize the CO2 passing there through to a pressure corresponding to a pressure existing at a depth within the terrestrial formation into which the terrestrial formation injection system is connected, such that the CO2 can be delivered into the terrestrial formation at the desired depth and without release of the CO2 into the atmosphere.

Claim 17 - A combustion engine providing clean power for various applications and featuring low NOx production, comprising in combination:

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air treatment device having an inlet coupled to said source of air, and having an outlet, said air treatment device including means to remove at least a portion of the nitrogen from the air entering said inlet;

a fuel combustion device, said fuel combustion device receiving fuel from said source of fuel and oxygen enriched air from said outlet of said air treatment device through an oxygen enriched air inlet adapted to deliver substantially H2O free oxygen enriched air into said fuel combustion device, said combustion device combusting said

fuel with the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including steam, said combustion device having a discharge for said combustion products;

a combustion product expansion device coupled to said discharge of said combustion device, said expansion device outputting power from said engine;

wherein said source of fuel includes fuel having both hydrogen and carbon therein;

wherein said fuel combustion device produces elevated pressure and elevated temperature combustion products including H2O and CO2; and

wherein said expansion device includes an exhaust for said combustion products including H2O and CO2, said exhaust upstream from a condenser, said condenser having an H2O outlet for liquid H2O and a gaseous combustion product outlet, said gaseous combustion products being a majority CO2, said condenser configured such that the CO2 remains gaseous and exits said condenser through said gaseous combustion product outlet; whereby CO2 generated by said engine is separated from other combustion products for further storage, handling and disposal of the CO2.

Claim 18 - The engine of Claim 17 wherein said gaseous combustion product outlet of said condenser is coupled to a compressor, said compressor including means to compress the gaseous combustion products including CO2 to a pressure above atmospheric pressure; and

a terrestrial formation injection system coupled to said compressor and to a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein without substantial release of CO2 into the atmosphere.

Claim 19 - The system of Claim 18 wherein said compressor includes means to compress said gaseous combustion products including CO2 to a pressure at which CO2 can exist in a liquid phase;

said compressor having an outlet coupled to a cooler, said cooler including means to cool gaseous combustion products including CO2 exiting said compressor to a temperature below a liquefaction temperature of CO2, such that CO2 within the gaseous combustion products is liquefied; and

a CO2 pump including means to pressurize said liquefied CO2 up to a pressure corresponding to a pressure at a depth within said terrestrial formation at which said injection system is configured to inject the CO2.

Claim 20 - A combustion engine providing clean power for various applications and featuring low NOx production and low CO2 release into the atmosphere, comprising in combination;

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air separator having an inlet coupled to said source of air, a nitrogen separator, an oxygen enriched air outlet, and a nitrogen outlet separate from said oxygen enriched air outlet, such that at least a portion of the nitrogen is removed from the air entering said inlet;

a fuel combustor, said fuel combustor receiving fuel from said source of fuel and oxygen enriched air from said outlet of said air separator, said combustor combusting the fuel with the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including H2O and CO2, said combustor having a discharge for said combustion products;

a combustion products separator which separates at least a portion of the H2O from other combustion products including CO2, said combustion products separator downstream from said discharge and including an H2O outlet and an exhaust for the other combustion products including CO2, said H2O outlet coupled to an H2O diluent path leading to an H2O inlet into said combustor, said H2O diluent path spaced from an oxygen enriched air inlet into said combustor;

a compressor coupled to said exhaust, said compressor pressurizing fluids passing there through to a pressure above atmospheric pressure; and

a terrestrial formation injection system downstream from said compressor, said injection system coupled to said compressor and to a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein.

Claim 21 - A combustion engine providing clean power for various applications and featuring low NOx production and low CO2 release into the atmosphere, comprising in combination:

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air separator having an inlet coupled to said source of air, a nitrogen separator, an oxygen enriched air outlet, and a nitrogen outlet separate from said oxygen enriched air outlet, such that at least a portion of the nitrogen is removed from the air entering said inlet;

a fuel combustor, said fuel combustor receiving fuel from said source of fuel and oxygen enriched air from said outlet of said air separator, said combustor combusting the fuel with the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including H2O and CO2, said combustor having a discharge for said combustion products;

a combustion product expansion device coupled to said discharge of said combustion device, said expansion device outputting power from said system and having an exhaust for said combustion products;

a condenser downstream from said exhaust, said condenser having an H2O outlet for liquid H2O and a gaseous combustion product outlet, said condenser configured such that the CO2 remains gaseous and exits said combustor through said gaseous combustion product outlet, said H2O outlet coupled to an H2O diluent path leading to an H2O inlet into said combustor, said H2O diluent path spaced from an oxygen

enriched air inlet into said combustor;

a compressor coupled to said gaseous combustion product outlet, said compressor compressing said gaseous combustion products to above atmospheric pressure; and

a terrestrial formation injection system coupled to said compressor and to a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein.

Claim 22 A combustion engine providing clean power for various applications and featuring low NOx production, comprising in combination:

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air treatment device having an inlet coupled to said source of air, and having an outlet, said air treatment device including means to remove at least a portion of the nitrogen from the air entering said inlet;

a fuel combustion device, said fuel combustion device receiving fuel from said source of fuel and oxygen enriched air from said outlet of said air treatment device, said combustion device combusting said fuel with the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including steam, said combustion device having a discharge for said combustion products;

a combustion product expansion device coupled to said discharge of said combustion device, said expansion device outputting power from said engine;

wherein said source of fuel includes fuel having both hydrogen and carbon therein;

wherein said fuel combustion device produces elevated pressure and elevated temperature combustion products including H2O and CO2; and

wherein said expansion device includes an exhaust for said combustion products including H2O and CO2, said exhaust upstream from a condenser, said condenser having an H2O outlet for liquid H2O and a gaseous combustion product outlet, said

H2O outlet coupled to an H2O diluent path leading to an H2O inlet into said combustion device, said H2O diluent path spaced from an oxygen enriched air inlet into said combustion device, said gaseous combustion products being a majority CO2, said condenser configured such that the CO2 remains gaseous and exits said condenser through said gaseous combustion product outlet; whereby CO2 generated by said engine is separated from other combustion products for further storage, handling and disposal of the CO2.

Claim 23 - A combustion engine providing clean power for various applications and featuring low NOx production and low CO2 release into the atmosphere, comprising in combination:

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air separator having an inlet coupled to said source of air, a nitrogen separator, an oxygen enriched air outlet, and a nitrogen outlet separate from said oxygen enriched air outlet, such that at least a portion of the nitrogen is removed from the air entering said inlet;

a fuel combustor, said fuel combustor receiving fuel from said source of fuel and oxygen enriched air from said oxygen enriched air outlet of said air separator through an oxygen enriched air inlet adapted to deliver substantially H2O free oxygen enriched air into said fuel combustor, said combustor combusting the fuel with the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including H2O and CO2, said combustor having a discharge for said combustion products;

a combustion product expansion device located downstream from said discharge of said combustion device, said expansion device outputting power from said system and having an exhaust for said combustion products;

a combustion products separator downstream from said exhaust, said separator having a first outlet for combustion products including H2O and a second gaseous combustion product outlet, said combustion products separator configured such that at least a portion of the CO2 remains gaseous and at least a portion of the CO2 exits said combustor through said second gaseous combustion product outlet;

said first outlet containing a stream of combustion products from said separator having a greater percentage of H2O than a percentage of H2O in the combustion products entering said separator, such that the stream of combustion products passing through said first outlet is H2O enriched;

a compressor located downstream from said gaseous combustion product outlet, said compressor compressing said gaseous combustion products to above atmospheric pressure; and

a terrestrial formation injection system located downstream from said compressor and upstream from a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein.

Claim 24 - The system of Claim 23 wherein said first outlet recirculates back into said system upstream of said expansion device.

Claim 25 - The system of Claim 24 wherein said first outlet recirculates at least a portion of the combustion products including H2O into said combustor.

Claim 26 - The system of Claim 23 wherein said compressor has sufficient capability to compress gases passing there through to a pressure at which a liquid phase of CO2 can exist; and

wherein said terrestrial formation injection system includes a liquid CO2 pump, said liquid CO2 pump including means to further pressurize the CO2 passing there through to a pressure corresponding to a fluid pressure existing at a depth within the terrestrial formation into which the terrestrial formation injection system is connected, such that the CO2 can be delivered into the terrestrial formation at the desired depth and

without release of the CO2 into the atmosphere.

Claim 27 - A combustion engine providing clean power for various applications and featuring low NOx production and low CO2 release into the Earth's atmosphere, comprising in combination:

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air treatment device having an inlet coupled to said source of air, and having an outlet, said air treatment device including a nitrogen separator, such that at least a portion of the nitrogen is removed from the air entering said inlet;

a fuel combustor, said fuel combustor receiving fuel from said source of fuel and O2 enriched air from said outlet of said air treatment device through an oxygen enriched air inlet adapted to deliver substantially H2O free oxygen enriched air into said fuel combustor, said combustor combusting said fuel with the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including steam and carbon dioxide, said combustor having a discharge for said combustion products;

a combustion product expander located downstream from said discharge of said combustor, said expander outputting power from said engine and having an exhaust for said combustion products;

wherein said fuel combustor produces elevated pressure and elevated temperature combustion products including H2O and CO2;

a combustion products separator located downstream of said combustor exhaust, said separator including an H2O outlet for an H2O enriched stream of the combustion products and a CO2 outlet for a CO2 enriched stream of the combustion products;

wherein said CO2 rich combustion product outlet of said separator is located upstream from a compressor, said compressor compressing the gaseous combustion products including CO2 to a pressure above atmospheric pressure; and

a terrestrial formation injection system located downstream from said compressor and upstream from a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein without substantial release of CO2 into the atmosphere.

Claim 28 - The engine of Claim 27 wherein said separator receives all of said combustion products exiting said exhaust.

Claim 29 - The engine of Claim 27 wherein said expander exhaust is located upstream from a condenser, said condenser having an H2O outlet for liquid H2O and a gaseous combustion product outlet, said gaseous combustion products being a majority CO2, said condenser configured such that the CO2 remains gaseous and exits said condenser through said gaseous combustion product outlet; whereby CO2 generated by said engine is separated from other combustion products for further storage, handling and disposal of the CO2.

Claim 30 - The engine of Claim 27 wherein said nitrogen separator of said air treatment device includes a means to remove at least a portion of the nitrogen from the air entering said inlet of said air treatment device.

Claim 31 - The engine of Claim 27 wherein said H2O outlet is coupled to a fluid conduit directing at least a portion of the H2O rich stream of combustion products passing through said H2O outlet back into said engine upstream of said combustion product expander.

Claim 32 - The engine of Claim 27 wherein at least a portion of the CO2 enriched combustion products exiting said CO2 outlet are routed to a condenser, said condenser condensing at least a portion of H2O remaining within the CO2 enriched combustion products entering said condenser, said condensed H2O exiting said condenser and routed back into said system upstream from said combustion product expansion device.

Claim 33 - The engine of Claim 27 wherein said fuel combustor includes an H2O inlet coupled to a pressurized source of H2O said H2O inlet delivery H2O into said

combustor to control a temperature of the combustion products in said combustor and exiting said combustor.

Claim 34 - A combustion device producing carbon dioxide for various applications and featuring low NOx production and low CO2 release into the atmosphere, comprising in combination:

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air separator having an inlet coupled to said source of air, a nitrogen separator, an oxygen enriched air outlet, and a nitrogen outlet separate from said oxygen enriched air outlet, such that at least a portion of the nitrogen is removed from the air entering said inlet;

a fuel combustor, said fuel combustor receiving fuel from said source of fuel and oxygen enriched air from said outlet of said air separator through an oxygen enriched air inlet adapted to deliver substantially H2O free oxygen enriched air into said fuel combustor, said combustor combusting the fuel with the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including H2O and CO2, said combustor having a discharge for said combustion products;

a combustion products separator downstream from said combustor device which separates at least a portion of the H2O from other combustion products including CO2 downstream from said discharge and including an H2O outlet for an H2O rich stream of the combustion products and an exhaust for the other combustion products including CO2;

a compressor downstream from said exhaust, said compressor pressurizing fluids passing there through to a pressure above atmospheric pressure; and

a terrestrial formation injection system downstream from said compressor, said injection system leading to a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein.

Claim 35 - The combustion device of Claim 34 wherein at least a portion of the H2O exiting said combustion products separator through said H2O outlet is routed through a fluid conduit to said fuel combustor where the H2O is combined with said combustion products to decrease a temperature of the combustion products and increase an amount of H2O exiting said discharge of said fuel combustor.

Claim 36 - The combustion device of Claim 34 wherein said combustion products separator includes a condenser, said condenser having a temperature and pressure therein at which at least a portion of the H2O in the combustion products condenses into a liquid phase and at which at least a portion of the CO2 in the combustion products remains in a gaseous phase.

Claim 37 - The combustion device of Claim 34 wherein a mass fraction of H2O in the said H2O rich stream of the combustion products is greater than a mass fraction of other components in said H2O rich stream of the combustion products.

Claim 38 - The combustion device of Claim 34 wherein the terrestrial formation is a subterranean formation which contains at least some hydrocarbons therein, the subterranean formation being penetrated by one or more wells, an injection system capable of injecting combustion products including CO2 into the hydrocarbon containing formation such that recovery of hydrocarbons from the hydrocarbon containing formation is enhanced.

Claim 39 - The combustion device of Claim 34 wherein a CO2 pump is located downstream from said compressor and upstream of said terrestrial formation injection system, said CO2 pump increasing a pressure of the CO2 exiting the exhaust of the combustion products separator while the CO2 is at least partially in a liquid state.

Claim 40 - The combustion device of Claim 39 wherein said CO2 pump includes means to pressurize the fluids passing there through to a pressure which results in a pressure of between 10 psi above the pressure of the fluid in said formation and a pressure less than 0.8 psi per foot of depth of said formation.

Claim 41 - The combustion device of Claim 34 wherein a combustion product expansion device is interposed between said discharge of said fuel combustor and said separator, said combustion product expansion device including means to output power from said engine.

Claim 42 - The combustion device of Claim 41 wherein said output power is at least partially used to supply operative power to said air separator.

Claim 43 - The combustion device of Claim 41 wherein said combustion product expansion device includes at least two turbines including a high pressure turbine located downstream from said discharge of said fuel combustor and upstream from a reheater, said reheater receiving fuel from said source of fuel and oxygen enriched air from said outlet of said air separator, said reheater combusting the fuel with the oxygen enriched air to produce combustion products including H2O and CO2, said reheater also receiving H2O and CO2 from said high pressure turbine and mixing at least a portion of said H2O and said CO2 from said high pressure turbine with at least a portion of said H2O and said CO2 generated within said reheater.

Claim 44 - The combustion device of Claim 34 wherein said injection system is configured to deliver at least a portion of the combustion products including CO2 into a terrestrial formation taken from the group of terrestrial formations including: beneath the surface of an ocean, into an aquifer, into a hydrocarbon containing formation and into a porous underground geological formation.

Claim 45 - The combustion device of Claim 34 wherein said exhaust of said combustion products separator discharges primarily CO2 and said compressor pressurizes the CO2 until the CO2 becomes a super critical fluid.

Claim 46 - A combustion engine providing clean power for various applications and featuring low NOx production and low CO2 release into the atmosphere, comprising in combination:

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air separator having an inlet coupled to said source of air, a nitrogen separator, an oxygen enriched air outlet, and a nitrogen outlet separate from said oxygen enriched air outlet, such that at least a portion of the nitrogen is removed from the air entering said inlet;

a fuel combustor, said fuel combustor receiving fuel from said source of fuel and oxygen enriched air from said oxygen enriched air outlet of said air separator, said combustor combusting the fuel with the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including H2O and CO2, said combustor having a discharge for said combustion products;

a combustion product expansion device located downstream from said discharge of said combustion device, said expansion device outputting power from said system and having an exhaust for said combustion products;

a combustion products separator downstream from said exhaust, said separator having a first outlet for combustion products including H2O and a second gaseous combustion product outlet, said first outlet coupled to an H2O diluent path leading to an H2O inlet into said combustor, said H2O diluent path spaced from an oxygen enriched air inlet into said combustor, said combustion products separator configured such that at least a portion of the CO2 remains gaseous and at least a portion of the CO2 exits said combustor through said second gaseous combustion product outlet;

said first outlet containing a stream of combustion products from said separator having a greater percentage of H2O than a percentage of H2O in the combustion products entering said separator, such that the stream of combustion products passing through said first outlet is H2O enriched;

a compressor located downstream from said gaseous combustion product outlet, said compressor compressing said gaseous combustion products to above atmospheric

pressure; and

a terrestrial formation injection system located downstream from said compressor and upstream from a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein.

Claim 47 - A combustion engine providing clean power for various applications and featuring low NOx production and low CO2 release into the Earth's atmosphere, comprising in combination:

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air treatment device having an inlet coupled to said source of air, and having an outlet, said air treatment device including a nitrogen separator, such that at least a portion of the nitrogen is removed from the air entering said inlet;

a fuel combustor, said fuel combustor receiving fuel from said source of fuel and oxygen enriched air from said outlet of said air treatment device, said combustor combusting said fuel with the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including steam and carbon dioxide, said combustor having a discharge for said combustion products;

a combustion product expander located downstream from said discharge of said combustor, said expander outputting power from said engine and having an exhaust for said combustion products;

wherein said fuel combustor produces elevated pressure and elevated temperature combustion products including H2O and CO2;

a combustion products separator located downstream of said combustor exhaust, said separator including an H2O outlet for an H2O enriched stream of the combustion products and a CO2 outlet for a CO2 enriched stream of the combustion products, said H2O outlet coupled to an H2O diluent path leading to an H2O inlet into said combustor, said H2O diluent path spaced from an oxygen enriched air inlet into said combustor;

wherein said CO2 rich combustion product outlet of said separator is located upstream from a compressor, said compressor compressing the gaseous combustion products including CO2 to a pressure above atmospheric pressure; and

a terrestrial formation injection system located downstream from said compressor and upstream from a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein without substantial release of CO2 into the atmosphere.

Claim 48 - A combustion device producing carbon dioxide for various applications and featuring low NOx production and low CO2 release into the atmosphere, comprising in combination:

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air separator having an inlet coupled to said source of air, a nitrogen separator, an oxygen enriched air outlet, and a nitrogen outlet separate from said oxygen enriched air outlet, such that at least a portion of the nitrogen is removed from the air entering said inlet;

a fuel combustor, said fuel combustor receiving fuel from said source of fuel and oxygen enriched air from said outlet of said air separator, said combustor combusting the fuel with the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including H2O and CO2, said combustor having a discharge for said combustion products;

a combustion products separator downstream from said combustor device which separates at least a portion of the H2O from other combustion products including CO2 downstream from said discharge and including an H2O outlet for an H2O rich stream of the combustion products and an exhaust for the other combustion products including CO2, said H2O outlet coupled to an H2O diluent path leading to an H2O inlet into said combustor, said H2O diluent path spaced from an oxygen enriched air inlet into said

combustor;

a compressor downstream from said exhaust, said compressor pressurizing fluids passing there through to a pressure above atmospheric pressure; and

a terrestrial formation injection system downstream from said compressor, said injection system leading to a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein.

Claim 49 - A combustion engine providing clean power for various applications and featuring low NOx production and low CO2 release into the atmosphere, comprising in combination:

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air separator having an inlet coupled to said source of air, a means to separate at least a portion of the nitrogen from the oxygen, an oxygen enriched air outlet, and a nitrogen outlet separate from said oxygen enriched air outlet;

a fuel combustor, said fuel combustor receiving fuel from said source of fuel and oxygen enriched air from said oxygen enriched air outlet of said air separator through an oxygen enriched air inlet adapted to deliver substantially H2O free oxygen enriched air into said fuel combustor, said combustor combusting at least a portion of the fuel with at least a portion of the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including H2O and CO2, said combustor having a discharge for said combustion products;

a combustion product expansion device located downstream from said discharge of said combustion device and having an exhaust for said combustion products;

a reheater downstream from said exhaust of said combustion product expansion device, said reheater elevating a temperature of said combustion products entering said reheater;

a combustion products separator downstream from said fuel combustor, said separator having a first outlet for combustion products including H2O and a second combustion product outlet for at least a portion of the CO2;

a compressor located downstream from said second combustion product outlet, said compressor compressing said combustion products to above atmospheric pressure; and

a terrestrial formation injection system located downstream from said compressor and upstream from a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein.

Claim 50 - The combustion engine of Claim 49 wherein said combustion products separator is located downstream from said reheater.

Claim 51 - The combustion engine of Claim 49 wherein said reheater includes a combustion product inlet downstream from said exhaust of said combustion product expansion device and a fuel inlet, said reheater adapted to combust said fuel to elevate the temperature of the combustion products within said reheater.

Claim 52 - The combustion engine of Claim 49 wherein said reheater includes a combustion products inlet downstream from said exhaust of said combustion product expansion device and an oxygen enriched air inlet downstream from said oxygen enriched air outlet of said air separator, the reheater adapted to combust at least a portion of the oxygen in the oxygen enriched air within the reheater to elevate the temperature of the combustion products.

Claim 53 - The combustion engine of Claim 52 wherein said reheater includes a fuel inlet downstream from said source of fuel, said reheater adapted to combust at least a portion of the fuel from said source of fuel with at least a portion of the oxygen from said oxygen enriched air outlet of said air separator to both produce additional elevated pressure and elevated temperature combustion products including H2O and CO2 and elevate a temperature of said combustion products entering said reheater from said

exhaust of said combustion product expansion device.

Claim 54 - The combustion engine of Claim 53 wherein said fuel inlet and said oxygen enriched air inlet of said reheater bring the fuel and the oxygen enriched air into direct contact with said combustion products entering said reheater from said exhaust of said combustion product expansion device.

Claim 55 - The combustion engine of Claim 54 wherein said reheater includes an outlet for a mixture of combustion products formed within said reheater and combustion products entering said reheater through said combustion product inlet.

Claim 56 - The combustion engine of Claim 49 wherein a second combustion product expansion device is located downstream from an outlet for combustion products exiting said reheater.

Claim 57 - The combustion engine of Claim 56 wherein at least one of said expansion devices is adapted to output power from said system.

Claim 58 - The combustion engine of Claim 49 wherein the terrestrial formation is a subterranean formation which contains at least some hydrocarbons therein, the subterranean formation being penetrated by one or more wells, an injection system capable of injecting combustion products including CO2 into the hydrocarbon containing formation, such that recovery of hydrocarbons from the hydrocarbon containing formation is enhanced.

Claim 59 - A combustion engine providing clean power for various applications and featuring low NOx production and low CO2 release into the atmosphere, comprising in combination:

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air separator having an inlet coupled to said source of air, a means to separate at least a portion of the nitrogen from the oxygen, an oxygen enriched air outlet, and a nitrogen outlet separate from said oxygen enriched air outlet;

a combustor, said combustor including a fuel inlet downstream from said fuel source, an oxygen inlet adapted to deliver substantially H2O free oxygen into said combustor downstream from said oxygen enriched air outlet of said air separator, and a discharge for a first working fluid including products of combustion of the fuel from said fuel source with the oxygen from said air separator, said first working fluid including H2O and CO2;

a first expander located downstream from said combustor, said first expander having an outlet for said first working fluid; and

a reheater located downstream from said first expander, said reheater elevating a temperature of the first working fluid entering said reheater.

Claim 60 - The combustion engine of Claim 59 wherein said reheater includes a fuel inlet coupled to a source of fuel including carbon and hydrogen, an oxygen inlet coupled to a source of oxidizer, the oxidizer having more oxygen than is present in air, a first working fluid inlet downstream from said first expander outlet and a reheater discharge for a second working fluid comprised of the first working fluid from said outlet of said first expander and products of combustion of the fuel from said fuel source and the oxidizer.

Claim 61 - The combustion engine of Claim 59 wherein said first expander is adapted to output power from said combustion engine.

Claim 62 - The combustion engine of Claim 59 wherein a second expander is located downstream from said reheater, at least one of said expanders adapted to output power from said combustion engine.

Claim 63 - The combustion engine of Claim 59 wherein said combustor includes a water inlet coupled to a source of water, said water inlet spaced from said oxygen inlet and adapted to direct water into said combustor.

Claim 64 - The combustion engine of Claim 63 wherein at least a portion of said water at said source of water includes water exiting downstream from said reheater as a

component of products of combustion generated within said combustion engine.

Claim 65 - The combustion engine of Claim 59 wherein a separator is located downstream from said reheater, said separator separating at least a portion of the water in said working fluid from a portion of the carbon dioxide in said working fluid.

Claim 66 - The combustion engine of Claim 65 wherein said separator includes a CO2 outlet for a portion of said working fluid having a greater concentration of CO2 than the concentration of CO2 within the working fluid;

a compressor downstream of said separator outlet, said compressor compressing fluids therein to above atmospheric pressure; and

a terrestrial formation injector located downstream from said compressor and upstream from a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein.

Claim 67 - A hydrocarbon combustion power generation system, comprising in combination:

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air separator having an inlet coupled to said source of air, a means to separate at least a portion of the nitrogen from the oxygen, an oxygen enriched air outlet, and a nitrogen outlet separate from said oxygen enriched air outlet;

a combustor downstream of said source of fuel and said oxygen enriched air outlet of said air separator through an oxygen enriched air inlet adapted to deliver substantially H2O free oxygen enriched air into said combustor, said combustor combusting the fuel with the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including H2O and CO2, said combustor having a discharge for said combustion products;

a first combustion products expander located downstream from said discharge of said combustor;

a reheater downstream from said first combustion products expander;

a second combustion products expander located downstream from said reheater; and

at least one of said expanders adapted to output power from said power generation system.

Claim 68 - The power generation system of Claim 67 wherein a separator is located downstream from said reheater, said separator including a CO2 outlet for collecting CO2 generated within the power generation system.

Claim 69 - The power generation system of Claim 68 wherein a compressor is located downstream from said CO2 outlet of said separator, said compressor compressing the CO2 to above atmospheric pressure, said compressor upstream from a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein.

Claim 70 - The power generation system of Claim 69 wherein power to drive said compressor is at least partially provided by power outputted from at least one of said combustion product expanders.

Claim 71 - The power generation system of Claim 67 wherein at least a portion of the water in said combustion products is produced within said combustor and is recirculated along a water diluent path leading to a water inlet adapted to direct water into said combustor, said water diluent path spaced from said oxygen enriched air inlet into said combustor.

Claim 72 - A combustion engine providing clean power for various applications and featuring low NOx production and low CO2 release into the atmosphere, comprising in combination:

a source of air, the air including nitrogen and oxygen;

a source of fuel, the fuel including hydrogen and carbon;

an air separator having an inlet coupled to said source of air, a means to separate at least a portion of the nitrogen from the oxygen, an oxygen enriched air outlet, and a nitrogen outlet separate from said oxygen enriched air outlet;

a fuel combustor, said fuel combustor receiving fuel from said source of fuel and oxygen enriched air from said oxygen enriched air outlet of said air separator, said combustor combusting at least a portion of the fuel with at least a portion of the oxygen enriched air to produce elevated pressure and elevated temperature combustion products including H2O and CO2, said combustor having a discharge for said combustion products;

a combustion product expansion device located downstream from said discharge of said combustion device and having an exhaust for said combustion products;

a reheater downstream from said exhaust of said combustion product expansion device, said reheater elevating a temperature of said combustion products entering said reheater;

a combustion products separator downstream from said fuel combustor, said separator having a first outlet for combustion products including H2O and a second combustion product outlet for at least a portion of the CO2, said first outlet coupled to an H2O diluent path leading to an H2O inlet into said combustor, said H2O diluent path spaced from an oxygen enriched air inlet into said combustor;

a compressor located downstream from said second combustion product outlet, said compressor compressing said combustion products to above atmospheric pressure; and

a terrestrial formation injection system located downstream from said compressor and upstream from a terrestrial formation beneath the atmosphere, said terrestrial formation capable of holding CO2 therein.